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EXAMINER	
BARON, HENRY	
ART UNIT	PAPER NUMBER
2416	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/996,102	MOLUF, ALLAN	
	Examiner	Art Unit	
	HENRY BARON	2416	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 September 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *13-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *13-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

High Capacity, Low-Latency Multiplexer

Response to Arguments/Remarks

1. Claims 1 – 12 have been cancelled with claims 13 – 16 new in the pending application.

2. Applicant's arguments filed 09/22/2008 have been fully considered but they are not persuasive.

3. Applicant argues that the Tsai '552 reference does not include logic that reschedules portions of packet data only when the rescheduling reduces the latency of the data in the output data stream. As shown in Fig. 2 of Tsai '552, Tsai's rescheduling logic clearly reschedules portions of a video frame whenever the size video frame exceeds the threshold set by the capacity of the channel. For example, the portion of frame 3 which is above the constant bit rate threshold is rescheduled to frame 4. Tsai's rescheduling logic serves to increase the latency of frame 3, as received from the output stream, because a receiver would need to delay acting on frame 3 until frame 4 is received. It is only when frame 4 is received that frame 3 is completely received. In contrast, Claim 13 requires a multiplexer with a scheduler that ensures reduced latency for received frames by always rescheduling portions of a frame whose size exceeds a threshold to an earlier frame in the output data stream, and not to a later frame in the output data stream.

4. Examiner replies that a careful reading of the reference has Tsai '552, in fact, teaching of reducing of the latency. Though Applicant argues on an interpretation of frame 3 in Figure 2, where latency is increased, since the frame cannot be processed until frame 4 is received, Tsai '552, in 2: [0010] Tsai teaches of frame 5 where the excess bits over the threshold are sent with earlier frame 4, and processed accordingly i.e. 'For example, in FIG. 2, excess bits 20 associated with Frame 5 (18e) are shown with bits 16d tagged from Frame 4 (18d) i.e. earlier frame. Therefore, the excess bits 20 representing the frame at time t+1 (where, for example, t=Frame 4 (18e)), may be transmitted along with

the bits 16d associated with the frame at time t (Frame 4 (18d)) because excess bandwidth may be available for transmission for that frame.'

5. Examiner contests that Tsai does not include logic that reschedules portions of packet data only when the rescheduling reduces the latency of the data in the output data stream on the basis of Tsai '552 Figure 2. Though Figure 2 can narrowly be interpreted to increase the latency of one frame as Applicant argues above, the example cited by Tsai for Figure 2 reduces latency. Further, as cited below, Gringeri '226 teaches of a just-in-time scheduling process with a look-ahead process so that data can be sent early to reduce the overall rate and latency.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> a. A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 13 – 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gringeri (U.S. Patent 6108382) in view of Tsai, et al (U.S. Patent 6,529,552) and in further view of Gringeri (U.S. Patent 6233226) hereafter Gringeri '226.

8. In consideration of claim 13, Gringeri teaches of a method for multiplexing compressed video input data streams and a multiplexer for combining a plurality of compressed video input data streams into an output data stream, each input data stream divided into video frames, into an output data stream with low latency, the method comprised of (a) . a buffer, the buffer capable of holding a plurality of output video frames (5: [0067] read Encoder 110 operates with, for example, inverse telecine turned off for the NTSC video source and scene detection turned off to generate a fixed length Group Of Pictures (GOP) i.e. a buffer, the buffer capable of holding a plurality of output video frames; (b) logic combining

corresponding video frames from each input data stream to form in the buffer a corresponding video frame for the output data stream (6: [0007] read FIG. 2 illustrates the encoded variable bit rate MPEG-2 video at the output of encoder 110 in accordance with an embodiment of the invention. In the encoded video, encoder 110 sets a GOP structure of, for example, 15 frames (i.e., N=15), which includes 1 intracoded (I) frame, 4 predicted (P) frames, and 10 bidirectional (B) frames.)

9. However Gringeri is silent with regards to disclosing (c) a scheduler adapted to rearrange the order of data in the buffer, the order of data in the buffer determining transmission time of video data in the output video stream, the scheduler rearranging the order of video data such that the latency of the video data in the output data stream is not thereby increased including: logic for dividing each corresponding input frame in the buffer that is larger than a threshold size into at least two parts, and logic for moving at least one part of each corresponding input frame in the buffer that is larger than a threshold size such that the at least one part of the corresponding input frame is transmitted in the output data stream than the corresponding video frame for the output data stream is transmitted.

10. Tsai teaches a scheduler adapted to rearrange the order of data in the buffer, the order of data in the buffer determining transmission time of video data in the output video stream, the scheduler rearranging the order of video data such that the latency of the video data in the output data stream is not thereby increased including: logic for dividing each corresponding input frame in the buffer that is larger than a threshold size into at least two parts, and logic for moving at least one part of each corresponding input frame in the buffer that is larger than a threshold size such that the at least one part of the corresponding input frame is transmitted in the output data stream than the corresponding video frame for the output data stream is transmitted; (Figure 2; dividing the given video frame into at least a first part and a second part (4: [0014] read [a] bit budget per frame 14 may be illustrated that may be constant in a constant capacity network. Examiner notes that bit budget per frame element 14 is a threshold size, dividing the given video frame into at least a first part and a second part; 5: [0010] read FIG. 2 illustrates

the same series of coded bits re-distributed over the same frames 18a-18g in time as shown in FIG. 1. The re-distribution considers utilizing skipped frames in the variable rate bitstream to place bits from neighboring frames into the bitstream prior to or otherwise adjacent to their actual decode times. This method may be used with storage and delivery of content which has been encoded off-line. The information may be stored in the bitstream in such a way that it can be delivered and decoded over a constant bit-rate channel with constant quality. This capability may come from the storage of some bits generated from future frames being stored in special user-defined data fields in prior or otherwise adjacent frames. For example, in FIG. 2, excess bits 20 associated with Frame 5 (18e) are shown with bits 16d tagged from Frame 4 (18d). Therefore, the excess bits 20 representing the frame at time t+1 (where, for example, t=Frame 4 (18e)), may be transmitted along with the bits 16d associated with the frame at time t (Frame 4 (18d)) because excess bandwidth may be available for transmission for that frame.)

11. However Tsai does not teach the limitation where the corresponding input frame is transmitted earlier in the output data stream than the corresponding video frame for the output data stream is transmitted.

12. Gringeri '226 teaches this limitation. (5: [0052] read the just-in-time scheduling process of the invention may be modified with a look-ahead process to determine when high cell rates will be required so that data can be sent early to reduce the overall rate without overflowing the decoder buffer.)

13. It would have been obvious at the time the invention was made by a person having ordinary skill in the art to modify the compressed video multiplexing data streams teachings of Gringeri with the rescheduled frame transmission teachings of Tsai and just-in-time early scheduling teachings of Gringeri '226.

14. With such a modification, the transmit channel can be optimally used by redistributing bits from over to under utilized frame slots, allowing the stream to be transmitted with low latency.

15. In consideration of claim 14 Gringeri teaches of a method for multiplexing compressed video input data streams, each input data stream divided into video frames, into an output data stream with low latency but does not teach of a predetermined threshold size.

16. Tsai teaches a method where the threshold size is predetermined. (Figure 2 and 5: [0008] read [a] bit budget per frame 14 i.e. threshold, may be illustrated that may be constant in a constant capacity network.).

17. It would have been obvious at the time the invention was made by a person of to having ordinary skill in the art to modify the compressed video multiplexing data streams teachings of Gringeri with the predetermined threshold size teachings of Tsai.

18. With this modification, once a video frame size exceeds a predetermined threshold, it can be partitioned into parts and parts can be rescheduled for transmission with an earlier, smaller video frame. In this manner, the bursts of large video frames are regulated by redistribution allowing the full channel capacity to be used effectively.

19. In consideration of claims 15, Gringeri teaches of a method for multiplexing compressed video input data streams, each input data stream divided into video frames, into an output data stream with low latency but does not teach of a adaptively determining the threshold size.

20. Tsai teaches a method where the threshold size is adaptively determined. (Figure 4 and 6:[0015] read [a]s illustrated in FIG. 4, a flowchart 70 of a method for managing bit expenditures associated with a digitally compressed video bitstream for variable capacity networks may be provided. The method may include a step 72 that may analyze users requested quality of service (QoS) including temporal and spatial visual quality measures, network capacity and availability, enhanced feature compliance, such as, for example, scalability, and number of users supported by the network. A step 74 may manage the temporal frame rate of a coded video sequence based on the users' requested temporal QoS, network capacity and availability, and the enhanced feature compliance and number of users supported by the network. Next, a

step 76 may change the quantization of the residual frames i.e. adaptive threshold, based on the users, requested spatial QoS, network capacity and availability, and the enhanced feature compliance and number of users supported by the network.).

21. It would have been obvious at the time the invention was made by a person of to having ordinary skill in the art to modify the compressed video multiplexing data streams teachings of Gringeri with the adaptive threshold size teachings of Tsai.

22. With this modification, once a video frame size exceeds an adaptively determined threshold, it can be partitioned into parts and parts can be rescheduled for transmission with an earlier, smaller video frame. In this manner, the bursts of large video frames are regulated by redistribution allowing the full channel capacity to be used effectively. By adaptively determining the threshold the channel loading can be matched with the bandwidth.

23. With regards to claim 16, Gringeri teaches wherein at least one of the input data streams is an MPEG-encoded video stream; (Abstract read [a] method and system for transmitting a video stream in an asynchronous transfer mode (ATM) network comprises steps of encoding the video into an MPEG-2 variable bit rate video stream, shaping the encoded variable bit rate video stream to conform to the traffic contract parameters for a Variable Bit Rate (VBR) connection in the network, and transmitting the shaped variable bit rate video stream on the VBR connection based on the traffic contract parameters..)

Conclusion

24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Henry Baron whose telephone number is (571) 270-1748. The examiner can normally be reached on 7:30 AM to 5:00 PM E.S.T. Monday to Friday.

25. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Seema Rao can be reached on (571) 272-3174. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

26. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000

/H. B./
Examiner, Art Unit 2416
HB

/Brenda Pham/

Primary Examiner, Art Unit 2416